



Electric regulating valve

CCMT

One valve, 4 applications: HPV, GBV, EV and EPR

Description

The CCMT is an electrically operated valve designed specifically for operation in CO₂ systems.

The CCMT valve concept is designed to fulfill global refrigeration requirements.

The valve is capable of functioning either as an expansion valve, as a pressure regulator for the gascooler or as a gas bypass valve with back pressure regulation in transcritical or subcritical applications.

Features & benefits

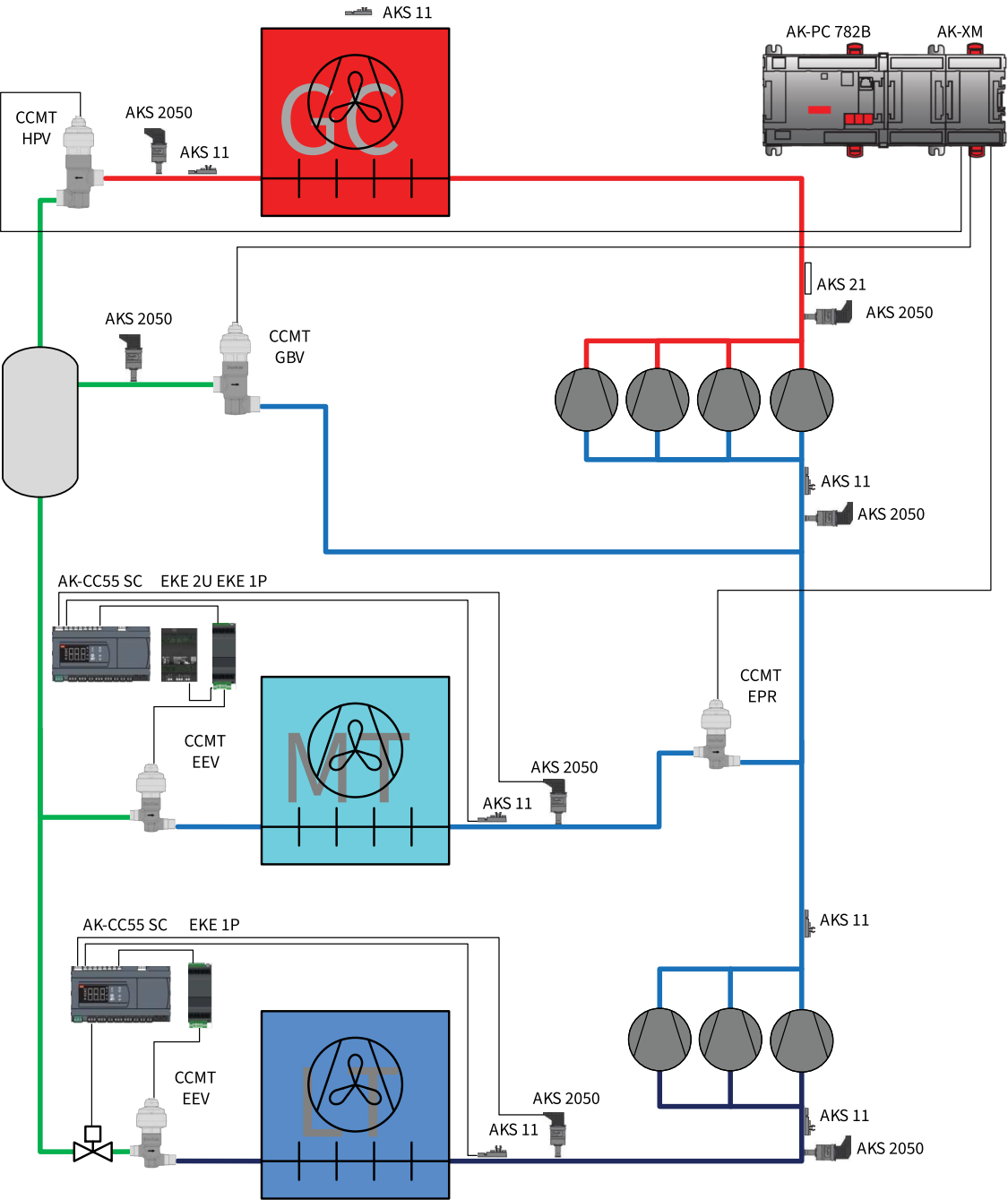
- Designed for CO₂ systems with maximum working pressure of 140 bar / 2030 psig
- Applicable to R744 (CO₂) and the CCMT is compatible with the oil types PAG, POE and PVE
- Regulating cone ensures optimum regulating accuracy, particularly at part load
- Patented cone and balance design
- The PEEK seat provides excellent valve tightness and robustness
- Combined butt weld and solder connections
- Top part with built-in strainer / filter
- MOPD up to 90 bar / 1305 psi and Low weight and compact design
- CCMT 16 – CCMT 42 are available with or without integrated pressure transmitter and easy to service and insert easily taken out by removing top part
- Standard M12 connector for simple and flexible connection to the motor driver and for manual operation and service of the CCMT an AST-g service driver is available



Applications

The CCMT valve is developed for transcritical CO₂ applications. The CCMT valve can be used in systems with flash gas bypass, parallel compression as well as in stand-alone applications. The CCMT valve can be used in transcritical and subcritical conditions. CCMT valves are typically used as flash gas bypass and high pressure regulation.

Figure: Application



—	HP High Pressure (120 – 140 bar Max working pressure)
—	HP Receiver Pressure (60 – 90 bar Max working pressure)
—	LP Suction Pressure MT (45 – 55 bar Max working pressure)
—	LP Suction Pressure LT (25 – 40 bar Max working pressure)

Application 1 - High Pressure Valve (HPV)

The function of the high pressure valve is to control the high pressure in the system according to the reference from the controller. The reference can be set to obtain the optimum COP, optimum capacity or any other factors. Pressure control is performed by the CCMT valve, which is installed at the outlet of the gas cooler (see the figure above) and a matching Danfoss controller. This design provides the possibility to optimize gas cooler pressure in all situations and intermediate receiver pressure independently.

Application 2 - Gas bypass Valve (GBV)

A gas bypass valve is typically used to control the receiver pressure in a transcritical CO₂ refrigeration system. By venting flash gas generated after the transcritical expansion through a gas bypass valve to the suction side of the compressor, the pressure can be kept at a safe level for all components situated in the liquid lines of a transcritical CO₂ system. The two phase mixture after HPV valve has to be separated in the receiver before gas enters the gas bypass.

Application 3- Expansion Valve (EV)

CCMT as an evaporator expansion valve is used on bigger air cooled evaporators or plate heat exchangers to control liquid injection according to measured superheat. For controlling all processes at air evaporators, including superheat control, it can be used AK-CC55 Single Coil+EKE 1P and for plate heat exchangers EKE 1C superheat controller with AKS 11 temperature and AKS 2050 pressure sensor.

Application 4 – Electric pressure regulator (EPR)

With CCMT valves, it is possible to obtain an accurate pressure control in the evaporator.

Please refer to the www.danfoss.com/en/markets/food-and-beverage/dcs/co2-in-food-retail/ for more information on CO₂ systems.

Ordering

Product code numbers

Valve including actuator

Table: Ordering CCMT without pressure transmitter

Type	Connections		Flow rate		Packing format	Code no.
	Butt-weld ⁽¹⁾ [in]	Solder ODF x ODF [in]	k_v [m ³ /h]	C_v [gpm]		
CCMT 2	1/2 × 1/2	5/8 × 5/8	0.17	0.19	Single pack	027H7200
CCMT 4	1/2 × 1/2	5/8 × 5/8	0.45	0.52	Single pack	027H7201
CCMT 8	1/2 × 1/2	5/8 × 5/8	0.8	0.92	Single pack	027H7202
CCMT 16	1 × 1	1 1/8 × 1 1/8	1.6	1.85	Single pack	027H8231
CCMT 24	1 × 1	1 1/8 × 1 1/8	2.4	2.77	Single pack	027H8232
CCMT 30	1 × 1	1 1/8 × 1 1/8	3	3.47	Single pack	027H8233
CCMT 42	1 × 1	1 1/8 × 1 1/8	4.2	4.86	Single pack	027H8234

⁽¹⁾ Reference pipe inch size for butt welding. Valve OD is 21.3 mm as reference: EN 10220

Table: Ordering CCMT 16-42 special version with integrated pressure transmitter

Type	Connections		Flow rate		Packing format	Code no.
	Butt-weld ⁽²⁾ [in]	Solder ODF x ODF [in]	k_v [m ³ /h]	C_v [gpm]		
CCMT 16	1 × 1	1 1/8 × 1 1/8	1.6	1.85	Single pack	027H7231
CCMT 24	1 × 1	1 1/8 × 1 1/8	2.4	2.77	Single pack	027H7232
CCMT 30	1 × 1	1 1/8 × 1 1/8	3	3.47	Single pack	027H7233
CCMT 42	1 × 1	1 1/8 × 1 1/8	4.2	4.86	Single pack	027H7234

⁽²⁾ Reference pipe inch size for butt welding. Valve OD is 33.7 mm as reference: EN 10220

Table: Ordering M12 angle cable

Cable	Cable length (L)	Insulation	Packing format	Code no.
PVC - black	2 + 0.089 m / 6.6 + 0.3 ft	SR-PVC	Single pack	034G7073
	8 + 0.3 m / 26.2 + 1 ft	SR-PVC	Single pack	034G7074

Accessories code numbers

Table: Spare parts

Type	Description	Packing format	Code no.
Gasket	O-ring spare part kit for CCM / CCMT 2 – CCMT 42	Single pack	027H7230
Filter and gasket ⁽¹⁾	Filter spare part kit for CCMT 16 – CCMT 42	Single pack	027H7280

⁽¹⁾ Two O-rings for CCMT 16 - CCMT 42 are included in 027H7280

Table: Packard cable for DST P310 pressure transmitter

Type	Description	Packing format	Code no.
Packard cable	10 m / 32.8 ft cable for DST P310 pressure transmitter	Industrial pack (14 pcs per pack)	064G0910
		Single pack	064G0950

Overview

Product portfolio

Table: Related products

Type	Description	Code no.
AK-PC 782B	Pack controller for transcritical booster CO ₂ systems	080Z0202
AK-XM 208C	Electronic driver AK-XM 208 for up to 4 stepper valves, used with AK-PC 78x B controllers	080Z0023
AK-CC55 Single Coil	Case/Cold room controller with EEV stepper valve solution	084B4182
EKE 1P	Electronic driver EKE 1P for 1 stepper valve	080G0325
EKE 1C	Superheat controller	080G5400
EKE 2U	Backup power module	080G5555
AST-G	Manual service driver	034G0013

Table: Portfolio overview

Pack Controller AK-PC for CO ₂	Electronic driver AK-XM 208C to be mounted with AK-PC 78x B	Case/room controller AK-CC55 Single Coil, for air evaporators
		
Electronic driver EKE 1P	Superheat controller EKE 1C	Backup power module EKE 2U
		

Product details

General data

Table: Technical data

Features	Description	
Valve types	CCMT 2 – CCMT 8	CCMT 16 – CCMT 42
Pressure direction ⁽²⁾	One directional	One directional
Compatibility refrigerants	- R744 - R1234yf	- R744 - R1234yf only for CCMT without integrated pressure transmitter
Refrigerant oils	PAG, POE and PVE	PAG, POE and PVE
MOPD	90 bar / 1305 psi	90 bar / 1305 psi
Max. working pressure (PS/MWP)	140 bar / 2030 psig	140 bar / 2030 psig
Refrigerant temperature range ⁽¹⁾	-40 – 60 °C / -40 – 140 °F	-40 – 60 °C / -40 – 140 °F
Ambient temperature	-40 – 60 °C / -40 – 140 °F	-40 – 60 °C / -40 – 140 °F
Material specification	Stainless steel	Stainless steel
Expected lifetime	Min. 15 years	Min. 10 years
Build in strainer / filter	Yes. Slots: 1.1 mm height x 10 mm wide CCMT 2: 6 slots, CCMT 4 – 8: 9 slots	Yes, 250 micron
Strainer / filter type	No	Replaceable
Comply with P.E.D.	Fluid Groups 1 & 2 / Article 4, paragraph 3	Fluid Groups 1 & 2 / Article 4, paragraph 3
Approval	CE and cURus	CE, UL, EAC, cURus, CRN
Internal leakage rate	<50 cm ³ /min @p=40 bar air	<1000 cm ³ /min @p=40bar air

⁽¹⁾ Measured at inlet of the valve

⁽²⁾ Avoid reverse pressure during system operation

Table: Electrical data

Features	Description	
Valve types	CCMT 2 – CCMT 8	CCMT 16 – CCMT 42
Stepper motor type	Bi-polar - permanent magnet	Bi-polar - permanent magnet
Motor enclosure	IP 67	IP 67
Step mode	2 phase full step, micro stepping (recommended)	2 phase full step, micro stepping (recommended)
Phase resistance	52 Ω ±10%	29 Ω ±10%
Phase inductance	85 mH	36.7 mH
Phase current	Using current driver: 100 mA RMS -4 % +15 %	Using current driver: 300 mA RMS -4 % +15 %
Holding current	Voltage driver: Depends on application. Current driver: Full current allowed	Not needed.
Duty cycle	100% duty cycle is allowed / 20% recommended	100% duty cycle is allowed / 20% recommended
Max. total power	Voltage drive: 5.5 W Current drive: 1.3 W (UL: NEC class 2)	Voltage drive: 10W Current drive: 2.8 W
Step rate	Current driver: Max. 300 steps/sec. (Recommended step rate: 200 steps/sec.) Voltage driver: Max. 150 steps/sec.	Current driver: Max. 300 steps/sec. (Recommended step rate: 200 steps/sec.) Voltage driver: Max. 150 steps/sec.
Total full steps	CCMT 2, 4 and 8: 1100 steps	CCMT 16: 800, CCMT 24: 1400, CCMT 30: 2300 and CCMT 42: 2200

Full travel time	CCMT 2, 4 and 8: 5 sec. (at 220 steps/sec.)	CCMT 16: 4 sec., CCMT 24: 7 sec. CCMT 30: 11.5 sec. and CCMT 42: 11 sec. (at 200 steps/sec.)
Reference position	Overdriving against full close position	Overdriving against full close position
Overdrive in close position	Max. 10% of total full steps	Max. 10% of total full steps and maximum one over- drive performed per hour.
Overdrive in open position	Not Allowed	Not Allowed
Electrical connection	Integrated M12 male connector	Integrated M12 male connector
Compatible controllers	EKE 1A, EKE 1B, EKE 1C, EKC 313, EKC 326A, AK-XM 208C, EKF 1A, EKF2A and EKE 100	EKE 1A, EKE 1B, EKE 1C, AK-XM 208C, EKF 1A, EKF2A and EKE 100

M12 angle cable

M12 angle female connector is intended for use with the standard M12 male connector on CCMT valves.

The Danfoss cable is designed to offer high flexibility and proper tensile strength.

The Danfoss M12 cable also consists of paired, twisted wires, which decreases mutual influence between signals transmitted along the cable and reduces influence of external sources of interference. The cable thus provides a higher degree of protection against lost steps compared to other cables.

Figure: Identification M12 angle cable

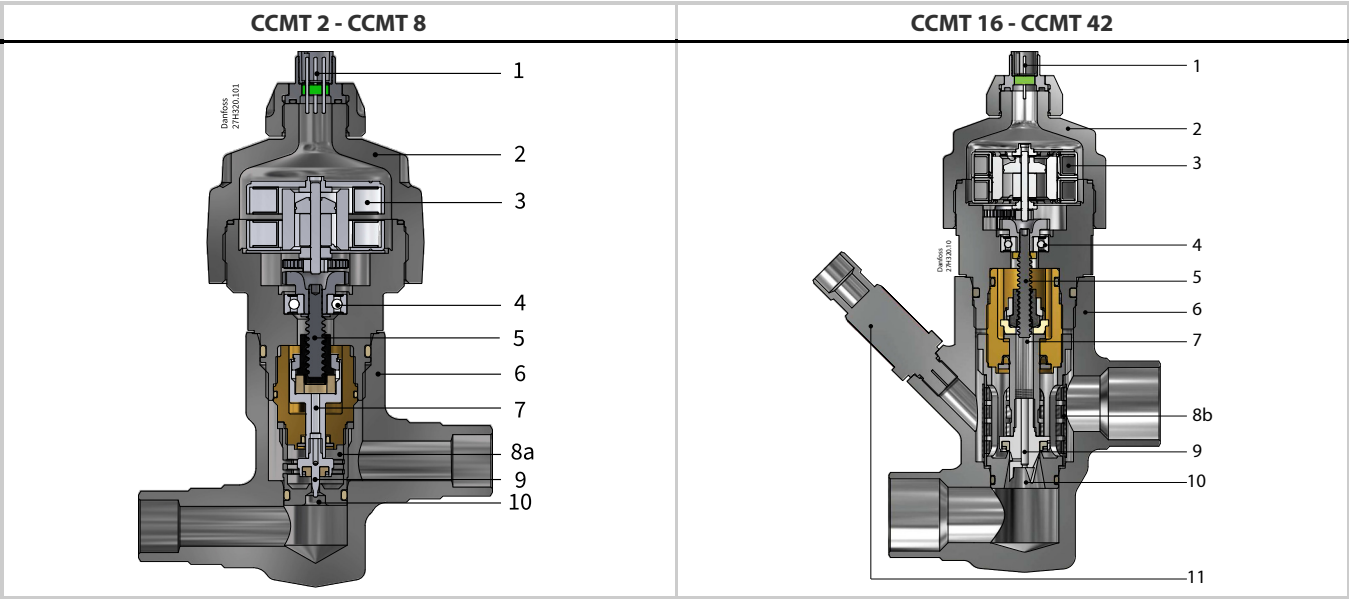


A	Product name
B	Product code no.
C	Cable length
D	Approvals
E	Data matrix
F	Danfoss logo
G	Country of origin
H	Place and date of production
I	Danfoss A/S address



Design

Table: Design



1	M12 connector
2	Actuator housing
3	Stepper motor
4	Ball bearing
5	Spindle
6	Valve housing
7	Balance piston

8a	Strainer
8b	Filter
9	Valve cone
10	Nozzle
11	Pressure transmitter (not included in CCMT 16 – CCMT 42 without integrated pressure transmitter)

Pressure and temperature data

Table: Pressure transmitter DST P310 (CCMT 16 – CCMT 42 with integrated pressure transmitter)

Pressure range	- 1 – 159 bar / -14.5 – 2306 psi sealed gauge
Electrical connection	Round Packard Metripack
Output signal	10 – 90 % of V supply
Supply voltage	5V DC ± 0.5V
Process connection	7/16-20 UNF-2A ISO 228/1; Viton O-ring

Stepper motor switch sequence

Table: Stepper motor switch sequence

	STEP	Coil II		Coil I		
		Red	Green	White	Black	
↓ CLOSING ↓	1	+	-	+	-	↑ OPENING ↑
	2	+	-	-	+	
	3	-	+	-	+	
	4	-	+	+	-	
	1	+	-	+	-	



Dimensions

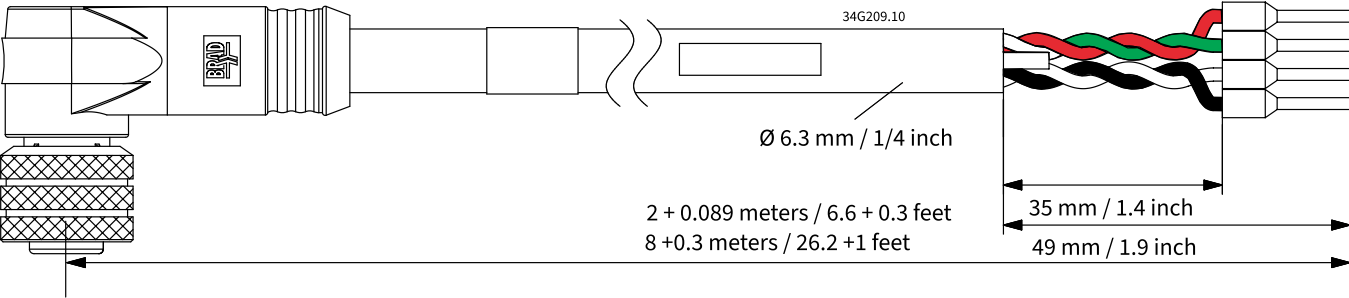
Table: Dimensions of CCMT without integrated pressure transmitter

CCMT 2 – CCMT 8 (Weight:1.5 kg / 3.3 lb)	CCMT 16 – CCMT 42 (Weight: 2.6 kg / 5.7 lb)

Table: Dimensions of CCMT with integrated pressure transmitter

Dimensions of CCMT 16 - 42 with integrated pressure transmitter

Figure: Dimensions



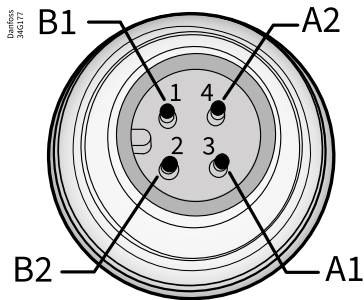


Connections

Table: Danfoss cable connection

Pin	Wire color
A1	White
A2	Black
B1	Red
B2	Green

Figure: CCMT valve



If the controller driving the CCMT valve is from another manufacturer than Danfoss or a custom design, the following points must be considered in order to overcome potential step loss.

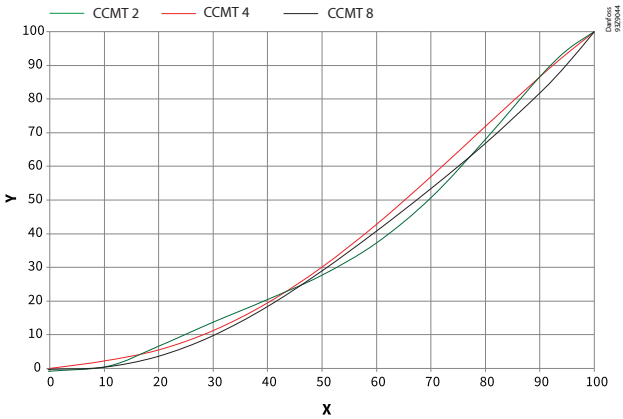
To ensure total closing of the valve, and to compensate the lost steps after a defined number of changes in opening degree, the controller should have a function to overdrive the valve in the closing direction. It is recommended to overdrive ten percent of the full steps range at appropriate intervals.

 WARNING:

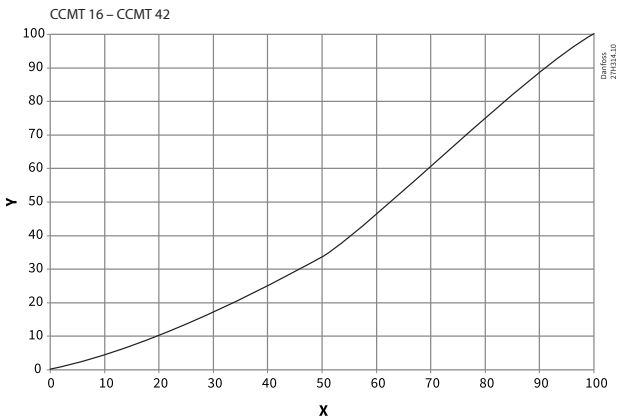
At power failure the CCMT valve will remain in the actual opening position it has at the moment of power failure, unless a safety device in the form of a battery backup is installed.



Flow characteristics



X	Opening %
Y	% of capacity full open



X	Opening %
Y	% of capacity full open

Figure: Connections

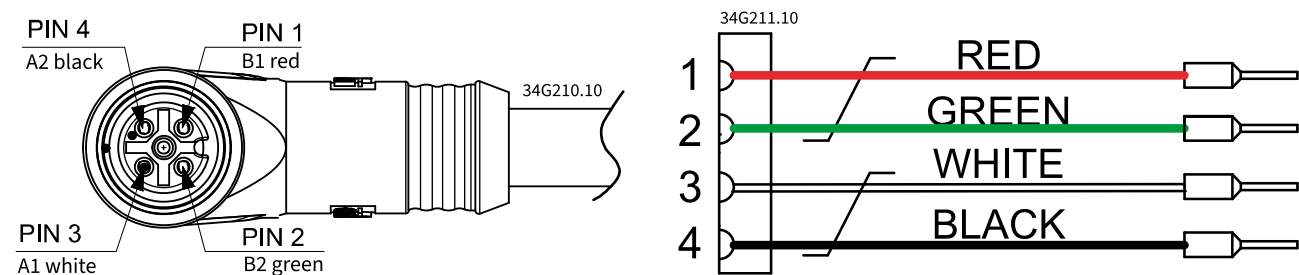


Table: Specification

Features	Description
Jacket	PVC - black
Cable outer sheath	Oil - resistant
Waterproof rating	IP 67
Operating temperature range	-40 – 80 °C
Wire type	Twisted pair, cross section 20 AWG / 0.5 mm ²
Cable outer diameter	7.0 mm
Minimum bending radius	10 x cable diameter
Cable combustibility / test	Flame retardant / VW-1 / CSA FT - 1
M12 standard	EN 61076-2-101
Reference standard	UL style 2464 and DIN VDE 0812
LVD directive	73/23/EEC and 93/68/EEC

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The list contains all certificates, declarations, and approvals for this product type. Individual code number may have some or all of these approvals, and certain local approvals may not appear on the list.

When you click on the link you will be directed to the latest version of the 'Declaration of Conformity'. Products developed and sold before this date of issue conform to the directives/standards in force at the time of their sale.

Approval type	Title	Certification body	Approval topic
Export Control Declaration	Pressure and Temperature regulating valves - Stainless steel	Danfoss	
UA Declaration	Danfoss UA 8481	Danfoss	UA RoHS
Mechanical Safety Certificate	UL MH7648	UL - Underwriters Laboratories inc.	
Pressure Safety Certificate	LLC CDC EURO-TYSK UA.TR.089.1015.02-22	LLC CDC EURO TYSK - Ukraine	PED, Pressure
UA Declaration	Danfoss UA 2023-01-10 Valves PL01 PL40	Danfoss	PED, Pressure
Manufacturer's Declaration	Danfoss MD 033F0691.AK	Danfoss	EU RoHS
Manufacturer's Declaration	Danfoss MD 033F0686.AT	Danfoss	PED, Pressure
Pressure Safety Certificate	TSSA CRN 0C23023.567890YTN	TSSA - Technical Standards & Safety Authority	CRN

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